## CLAIMS

1. An electronic ballast, comprising:

a rectifier circuit adapted to receive a low frequency AC voltage signal from an AC power source and to convert the low frequency AC voltage signal into a DC voltage signal;

an inverter circuit connected to the rectifier circuit, the inverter circuit adapted to convert the DC voltage signal into a high frequency AC voltage signal that can be used to supply power to a gas discharge lamp load connected to the inverter circuit; and

a ballast protection and control circuit coupled to the inverter circuit using an impedance element, the ballast protection and control circuit adapted to sense end of lamp life conditions and to cause the electronic ballast to be placed in an end of lamp life protected state when an end of lamp life condition is sensed.

2. The ballast of claim 1, wherein the impedance element used to couple the ballast protection and control circuit to the inverter circuit includes a resistive impedance element.

3. The ballast of claim 1, wherein the impedance element used to couple the ballast protection and control circuit to the inverter circuit includes a reactive impedance element.

4. The ballast of claim 1, wherein the ballast protection and control circuit is further adapted to cause the electronic ballast to generate multiple striking attempts if the gas discharge lamp load fails to ignite after an initial striking attempt, and to cause the electronic ballast to be placed in a lamp failure protected state if the gas discharge lamp load fails to ignite after a predetermined number of striking attempts.

5. The ballast of claim 1, wherein the ballast protection and control circuit is adapted to sense end of lamp life conditions by sensing a peak-to-peak voltage across the gas discharge lamp load.

6. The ballast of claim 1, wherein, prior to causing the electronic ballast to be placed in the disconnected protected state, the ballast protection and control circuit is adapted to cause the electronic ballast to generate multiple striking attempts.

7. The ballast of claim 1, wherein the ballast protection and control circuit is adapted to attempt to relamp the gas discharge lamp load when a voltage across a reignition reference component included in the ballast protection and control circuit exceeds a predetermined reignition reference voltage.

8. The ballast of claim 1, wherein the ballast protection and control circuit is adapted to sense end of lamp life and overheating conditions using a single combined protection circuit.

9. The ballast of claim 1, wherein the ballast protection and control circuit further adapted to sense overheating conditions and to cause the electronic ballast to be placed in an overheating protected state when an overheating condition is sensed.

10. The ballast of claim 1, wherein the ballast protection and control circuit is adapted to be connected in parallel across the gas discharge lamp load.

11. The ballast of claim 1, wherein the magnitude of current flowing through the ballast protection and control circuit is less than the magnitude of current flowing through the gas discharge lamp load.

12. An electronic ballast protection and control circuit, comprising: √

an end of lamp life sensing and control circuit adapted to sense an end of lamp life condition in a gas discharge lamp load connected to an electronic ballast and to cause the electronic ballast to enter an end of lamp life protected state when the end of lamp life condition occurs; and

wherein the end of lamp life sensing and control circuit is adapted to be capacitively coupled across an output of the electronic ballast, to sense the end of lamp life condition by sensing a peak-to-peak voltage that develops across the gas discharge lamp load when the end of lamp life condition occurs, to generate an end of lamp life control signal when the peak-to-peak voltage exceeds a predetermined end of lamp life reference voltage, and adapted to set the predetermined end of lamp life reference voltage using an end of lamp life reference component included in the end of lamp life sensing and control circuit.

13. The protection and control circuit of claim 12, wherein the end of lamp life sensing and control circuit is adapted to sense DC rectification and excessively high AC voltage end of lamp life conditions.

14. The protection and control circuit of claim 12, wherein the end of lamp life sensing and control circuit is adapted to be connected in parallel with the gas discharge lamp load.

15. The protection and control circuit of claim 12, wherein the end of lamp life sensing and control circuit is adapted so that current flowing through the sensing circuit is less than current flowing through the gas discharge lamp load.

16. The protection and control circuit of claim 12, wherein the end of lamp life sensing and control circuit includes an AC sensing component adapted to sense AC voltage developed across the gas discharge lamp load.

17. The protection and control circuit of claim 12, wherein the end of lamp life sensing and control circuit is further adapted to sense an overheating condition in

the electronic ballast and to cause the electronic ballast to enter an overheating protected state when the overheating condition occurs.

18. A protection and control circuit for an electronic ballast, comprising:

an end of lamp life sensing and control circuit adapted to be capacitively coupled across an output of the electronic ballast, to sense an end of lamp life condition in a gas discharge lamp load connected to the electronic ballast and to cause the electronic ballast to enter an end of lamp life protected state when the end of lamp life condition occurs;

wherein the end of lamp life sensing and control circuit is adapted to generate an end of lamp life control signal that is used to cause the electronic ballast to enter the end of lamp life protected state; and

wherein the end of lamp life sensing and control circuit is adapted to generate the end of lamp life control signal when a DC end of lamp life reference voltage generated by the end of lamp life sensing and control circuit exceeds a predetermined DC end of lamp life reference voltage.

19. The protection and control circuit of claim 18, wherein the end of lamp life sensing and control circuit is adapted to generate the DC end of lamp life reference

voltage by generating an AC end of lamp life reference voltage representative of a peak-to-peak voltage across the gas discharge lamp load and converting the AC end of lamp life reference voltage into the DC end of lamp life reference voltage.

20. The protection and control circuit of claim 19, wherein the end of lamp life sensing and control circuit is adapted to generate the AC end of lamp life reference voltage by dividing the peak-to-peak voltage across the gas discharge lamp load using a voltage divider network.

21. The protection and control circuit of claim 19, wherein the end of lamp life sensing and control circuit is adapted to convert the AC end of lamp life reference voltage into the DC end of lamp life reference voltage by:

rectifying the AC end of lamp life reference voltage to generate an end of lamp life charging current; and

charging a rectifier circuit capacitor using the end of lamp life charging current to generate the DC end of lamp life reference voltage.

22. The protection and control circuit of claim 18, wherein the end of lamp life sensing and control circuit is adapted to determine that the DC end of lamp life

reference voltage exceeds the predetermined DC end of lamp life reference voltage by:

applying the DC end of lamp life reference voltage to an end of lamp life voltage controlled switch included in the end of lamp life sensing and control circuit; and

wherein the end of lamp life voltage controlled switch includes an end of lamp life switching voltage that is equal to the predetermined DC end of lamp life reference voltage.

23. The protection and control circuit of claim 22, wherein the end of lamp life sensing and control circuit is adapted to generate the end of lamp life control signal when the end of lamp life switching voltage of the end of lamp life voltage controlled switch is exceeded by the DC end of lamp life reference voltage.

24. The protection and control circuit of claim 22, wherein the end of lamp life voltage controlled switch is a Zener diode.

25. A protection and control circuit for an electronic ballast, comprising:

an overheating sensing and control circuit adapted to be capacitively coupled across an output of the electronic ballast, to sense an overheating condition in a gas discharge lamp load connected to an electronic ballast and to cause the electronic ballast to enter an overheating protected state when the overheating condition occurs;

wherein the overheating sensing and control circuit is adapted to generate an overheating control signal that is used to cause the electronic ballast to enter the overheating protected state; and

wherein the overheating sensing and control circuit is further adapted to generate the overheating control signal only after the overheating condition occurs and using an overheating reference component included in the overheating sensing and control circuit.

26. The protection and control circuit of claim 25, wherein the overheating control signal is set at a first predetermined overheating reference voltage before the overheating condition occurs and, when the overheating condition occurs, steps up to a second predetermined overheating reference voltage.

27. The protection and control circuit of claim 25, wherein the overheating control signal is generated based on a peak-to-peak voltage across the gas discharge lamp load.

28. The protection and control circuit of claim 25, wherein the overheating sensing and control circuit is adapted to be connected in parallel across the gas discharge lamp load.

29. The protection and control circuit of claim 25, wherein the overheating sensing and control circuit is still further adapted to sense end of lamp life conditions in the electronic ballast and to cause the electronic ballast to enter an end of lamp life protected state when the end of lamp life conditions occur.

30. The protection and control circuit of claim 25, wherein the overheating sensing and control circuit is adapted to sense DC rectification and excessively high AC voltage end of lamp life conditions.

31. The protection and control circuit of claim 25, wherein the overheating sensing and control circuit is adapted so that current flowing through the sensing circuit is less than current flowing through the gas discharge lamp load.

32. The protection and control circuit of claim 25, wherein the overheating sensing and control circuit includes an AC sensing component adapted to sense AC voltage developed across the gas discharge lamp load.

33. A protection and control circuit for an electronic ballast, comprising:

an overheating sensing and control circuit adapted to be capacitively coupled across an output of the electronic ballast, to sense an overheating condition in a gas discharge lamp load connected to the electronic ballast and to cause the electronic ballast to enter an overheating protected state when the overheating condition occurs;

wherein the overheating sensing and control circuit is adapted to generate an overheating control signal that is used to cause the electronic ballast to enter the overheating protected state; and

wherein the overheating sensing and control circuit is adapted to generate the overheating control signal when a DC overheating reference voltage generated by

the overheating sensing and control circuit exceeds a predetermined DC overheating reference voltage.

34. The protection and control circuit of claim 33, wherein the overheating sensing and control circuit is adapted to generate the DC overheating reference voltage by generating an AC overheating reference voltage representative of a peak-to-peak voltage across the gas discharge lamp load and converting the AC overheating reference voltage into the DC overheating reference voltage.

35. The protection and control circuit of claim 34, wherein the overheating sensing and control circuit is adapted to generate the AC overheating reference voltage by dividing the peak-to-peak voltage across the gas discharge lamp load using a voltage divider network.

36. The protection and control circuit of claim 34, wherein the overheating sensing and control circuit is adapted to convert the AC overheating reference voltage into the DC overheating reference voltage by:

rectifying the AC overheating reference voltage to generate an overheating charging current; and

charging a rectifier circuit capacitor using the overheating charging current to generate the DC overheating reference voltage.

37. The protection and control circuit of claim 33, wherein the overheating sensing and control circuit is adapted to determine that the DC overheating reference voltage exceeds the predetermined DC overheating reference voltage by:

applying the DC overheating reference voltage to an overheating voltage controlled switch included in the overheating sensing and control circuit; and

wherein the overheating voltage controlled switch includes an overheating switching voltage that is equal to the predetermined DC overheating reference voltage.

38. The protection and control circuit of claim 37, wherein the overheating sensing and control circuit is adapted to generate the overheating control signal when the overheating switching voltage of the overheating voltage controlled switch is exceeded by the DC overheating reference voltage.

39. The protection and control circuit of claim 37, wherein the overheating voltage controlled switch is a Zener diode.

40. A control circuit for an electronic ballast, comprising:

a reignition sensing and control circuit adapted to sense when a gas discharge lamp load is reconnected to an electronic ballast and, in response, to generate a reignition control signal that can be used to cause the electronic ballast to attempt to reignite the gas discharge lamp load;

wherein the reignition control signal is generated when a voltage across a reignition reference component included in the reignition sensing and control circuit exceeds a predetermined reignition reference voltage; and

wherein the reignition sensing and control circuit is further adapted to amplify the reignition control signal using a regenerative feedback circuit.

41. The control circuit of claim 40, wherein the reignition control signal includes a spiked portion that occurs a predetermined amount of time after the gas discharge lamp load is reconnected to the electronic ballast.

42. The control circuit of claim 40, wherein the reignition sensing and control circuit generates the reignition control signal by generating and differentiating a DC reignition reference voltage.

43. The control circuit of claim 40, wherein the reignition control signal is initially a first predetermined reignition reference voltage and, after the gas discharge lamp load has been reconnected to the electronic ballast for a predetermined amount of time, jumps to a second predetermined reignition reference voltage and then drops back down to a third predetermined reignition reference voltage.

44. The control circuit of claim 40, wherein the reignition control signal is adapted so that it will only cause the electronic ballast to attempt to reignite the gas discharge lamp load for a predetermined amount of time after the gas discharge lamp load has been reconnected to the electronic ballast.

45. The control circuit of claim 40, wherein the reignition sensing and control circuit is adapted to generate the reignition control signal by:

generating a reignition reference voltage in response to the gas discharge lamp load being reconnected to the electronic ballast for a predetermined amount of time;

comparing the reignition reference voltage to a predetermined reignition reference voltage; and

when the reignition reference voltage exceeds the predetermined reignition reference voltage,

generating the reignition control signal.

46. The control circuit of claim 45, wherein the reignition sensing and control circuit is adapted to compare the reignition reference voltage to the predetermined reignition reference voltage by:

applying the reignition reference voltage to a reignition voltage clamping component included in the reignition sensing and control circuit; and

wherein the reignition voltage clamping component includes a reignition reference voltage that is equal to the predetermined reignition reference voltage.

47. The control circuit of claim 45, wherein the reignition sensing and control circuit is adapted to prevent the electronic ballast from being damaged when a lamp terminal included with the electronic ballast is connected to earth ground.

48. The control circuit of claim 45, wherein the reignition voltage clamping component is a Zener diode.

49. The control circuit of claim 40, wherein the reignition control signal is adapted so that it will not cause the electronic ballast to attempt to relamp the gas discharge lamp load after a predetermined reignition period has been exceeded unless power is removed from and reapplied to the electronic ballast.

50. A control circuit for an electronic ballast, comprising:

a multiple striking sensing and control circuit adapted to sense when a gas discharge lamp load connected to an electronic ballast fails to ignite in response to an initial striking attempt and, in response, to generate a multiple striking control signal that can be used to cause the electronic ballast to generate multiple striking attempts until the gas discharge lamp load ignites or a predetermined striking time period is exceeded;

the multiple striking sensing and control circuit being further adapted to generate, when the predetermined striking time period is exceeded, a lamp load failure control signal that can be used to cause the electronic ballast to enter a lamp failure protected state; and

wherein the multiple striking sensing and control circuit is still further adapted to generate the lamp load failure control signal based on a peak-to-peak voltage developed across the gas discharge lamp load.

51. The control circuit of claim 50, wherein a portion of the multiple striking sensing and control circuit is adapted to be connected in parallel with the gas discharge lamp load.

52. The control circuit of claim 50, wherein current flowing through a portion of the multiple striking sensing and control circuit is less than current flowing through the gas discharge lamp load.

53. The control circuit of claim 50, wherein the multiple striking sensing and control circuit includes an AC sensing component adapted to sense AC voltage developed across the gas discharge lamp load.

54. The control circuit of claim 50, wherein the multiple striking sensing and control circuit is further adapted to:

sense end of lamp life conditions in the electronic ballast and to cause the electronic ballast to enter an end of lamp life protected state when the end of lamp life conditions occur; and

sense an overheating condition in the electronic ballast and to cause the electronic ballast to enter an overheating protected state when the overheating condition occurs.

55. The control circuit of claim 50, wherein the multiple striking sensing and control circuit is adapted to generate the lamp failure control signal by:

generating an AC multiple striking reference voltage representative of the peak-to-peak voltage developed across the gas discharge lamp load;

converting the AC multiple striking reference voltage into a DC multiple striking reference voltage after a predetermined striking time period;

comparing the DC multiple striking reference voltage to a predetermined DC multiple striking reference voltage; and

when the DC multiple striking reference voltage exceeds the predetermined DC multiple striking reference voltage,

generating the lamp failure control signal.

56. The control circuit of claim 55, wherein the multiple striking sensing and control circuit is adapted to generate the AC multiple striking reference voltage by dividing the peak-to-peak voltage across the gas discharge lamp load using a voltage divider network.

57. The control circuit of claim 55, wherein the multiple striking sensing and control circuit is adapted to convert the AC multiple striking reference voltage into the DC multiple striking reference voltage by:

rectifying the AC multiple striking reference voltage to generate a multiple striking charging current; and

charging a rectifier circuit capacitor using the multiple striking charging current to generate the DC multiple striking reference voltage.

58. The control circuit of claim 55, wherein the multiple striking sensing and control circuit is adapted to compare the DC multiple striking reference voltage to the predetermined DC multiple striking reference voltage by:

applying the DC multiple striking reference voltage to a multiple striking voltage controlled switch included in the multiple striking sensing and control circuit; and

wherein the multiple striking voltage controlled switch includes a multiple striking switching voltage that is equal to the predetermined DC multiple striking reference voltage.

59. The control circuit of claim 55, wherein the multiple striking sensing and control circuit is adapted to generate the lamp failure control signal when the multiple striking switching voltage of the multiple striking voltage controlled switch is exceeded by the DC multiple striking reference voltage.

60. The control circuit of claim 55, wherein the multiple striking voltage controlled switch is a Zener diode.

61. A ballast protection and control circuit, comprising:

a combined reference voltage circuit adapted to be connected to a gas discharge lamp load and an electronic ballast, the combined reference voltage circuit including a voltage divider and a rectifier/charging circuit connected to the voltage divider; and

a combined comparison circuit connected to the combined reference voltage circuit, the combined comparison circuit including a combined voltage controlled switch connected to the rectifier/charging circuit.

62. The ballast protection and control circuit of claim 61, wherein:

the voltage divider includes a capacitor/resistor network;

the rectifier/charging circuit includes a resistor connected to a capacitor; and

the combined voltage controlled switch includes a Zener diode.

63. The ballast protection and control circuit of claim 61, further comprising:

a reignition reference voltage circuit adapted to be connected to a DC power source and the gas discharge lamp load, the reignition reference voltage circuit

including a reignition resistor network connected to a reignition charging circuit; and

a reignition comparison circuit including a reignition voltage controlled switch/latch connected to the reignition charging circuit and to a reignition differentiating circuit.

64. The ballast protection and control circuit of claim 63, wherein:

the reignition charging circuit includes a reignition resistor connected in parallel with a reignition capacitor;

the reignition voltage controlled switch/latch includes a Zener diode; and

the reignition differentiating circuit includes a differentiating capacitor connected to a differentiating resistor.

65. The ballast protection and control circuit of claim 61, further comprising a striking failure sensing circuit adapted to be connected to an inverter circuit in the electronic ballast.